Grants Pass Irrigation District
Oregon

AGRICULTURAL AND REHABILITATION REPORT

to

STATE RECLAMATION COMMISSION OF OREGON

by

DIVISION OF IRRIGATION
BUREAU OF AGRICULTURAL ENGINEERING
UNITED STATES DEPARTMENT OF AGRICULTURE

W. W. McLAUGHLIN
Chief

P. A. EWING
Associate Irrigation Economist

INCLUDING A PRIOR (1928) SOIL CLASSIFICATION

by

OREGON AGRICULTURAL EXPERIMENT STATION

DR. W. L. POWERS
Soil Scientist

July, 1933

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INTRODUCTION

This report, made to and at the instance of the State Reclamation Commission of Oregon, discusses the present agricultural, soil, operating, and economic circumstances of Grants Pass Irrigation District, Oregon, bringing up to date (July, 1933) the facts recited in a similar report made in August, 1928, by Dr. W. L. Powers, of Oregon Agricultural Experiment Station, and W. W. McLaughlin and Paul A. Ewing, of the United States Department of Agriculture.

Because of the effects of the widespread agricultural depression upon the affairs of the District and of certain efforts contemplated to place its finances upon a readjusted basis, the Commission requested the same agencies which had made the 1928 report to review the District's affairs and revise the 1928 report so as to make it represent the circumstances of 1933. A revision of the former soil survey and classification, for which Dr. Powers had been responsible, was not considered necessary. Accordingly, with the consent of the Station, the re-examination of the District's other circumstances was delegated to Paul A. Ewing, Associate Irrigation Economist of the United States Bureau of Agricultural Engineering, by W. W. McLaughlin, Chief of the Division of Irrigation, and the present report has been written by Mr. Ewing. Incidental assistance was given the latter in this task by Mr. McLaughlin and Dr. Powers, and helpful cooperation was also extended by the Board of Directors of the District and Forbes W. Fosbery, its Secretary-Manager, as well as by State Engineer Charles E. Stricklin, Secretary of the Commission, and D. J. McLellan, his assistant.

The 1933 survey was made in June, and this report was prepared in July.

Paul A. Ewing

Associate Irrigation Economist

INTRODUCTION

This report, made to and at the instance of the State Reclamation Commission of Oregon, discusses the present agricultural, soil, operating, and economic circumstances of Crooks Creek Irrigation District, Oregon, bringing up to date (July, 1933) the facts recited in a similar report made in August, 1929, by Mr. W. L. Powers, of Oregon Agricultural Experiment Station, and W. V. McLaughlin and Paul A. Swing, of the United States Department of Agriculture.

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Paul A. Swing

Associate Irrigation Economist

PART I.

PHYSICAL FEATURES

Location

Grants Pass Irrigation District is an area of land surrounding, and including a portion of, the city of Grants Pass, Oregon. The greater part of it lies in Josephine County, but a portion is in Jackson County. The lands are on both sides of Rogue River.

Area

The boundaries of the District inclose an area of some 18,400 acres, but the area assessed by the District in 1932 was 12,583 acres. Of this acreage, 6,806 acres is under cultivation. (The acreage represented by the three best soil classes shown in a later chapter of this report, is 12,436.3 acres.)

Organization and History

Grants Pass Irrigation District, a municipal corporation was organized under the Irrigation District laws of the State of Oregon as embodied in Title 48 Oregon Code 1930, and particularly under the provisions of Chapter 189 Laws of 1915 and acts amendatory thereof. Organization was effected in January, 1917, following petition for its formation which was filed with the County Court of Josephine County, December 9, 1916. The Court approved the petition and called an election for organization of the District and designation of a Board of Directors. This was held January 29, 1917. The vote, which was 41 to 5 in favor of organization, was canvassed by the Court on January 29. The first of the District's five bond elections which authorized the issuance of $290,000 six per cent bonds, was held October 4, 1917, the vote being 45 to 5. This authorization was confirmed by the Circuit Court of Josephine County, November 14, 1917, and its validity was later confirmed by the State Supreme Court.

The original area of the District was about 6,000 acres, the irrigation of which by plans first considered was to be effected by the extension of the gravity canal of Gold Hill Irrigation District, which is next above Grants Pass District on Rogue River. This plan was abandoned, and early in 1920 A. J. Wiley, of Boise, Idaho, consulting engineer for the purchaser of the bonds submitted a report on the feasibility of a project in which the Gold Hill extension was not involved, and outlined plans for the installation of a temporary pumping system for such lands as were then ready for irrigation. The plans finally adopted provided for a system comprised largely of permanent pumping units. June 19, 1920, the second bond issue -- $400,000 -- was authorized. The third and fourth issues -- $200,000 and $500,000 -- were authorized November 6, 1920, and January 3, 1921, by the following votes: 49 to none, and 38 to 2. The final issue of $75,000 was authorized at an election held October 10, 1922.

The District's principal structure -- the diversion dam at Savage Rapids -- was dedicated November 5, 1921, from which time the operating history of the present system may be considered to extend.

The dates and amounts of the various bond issues are suggestive of the conditions under which the project was built. Such construction was then generally expensive, and this job, as were many others, was done under the "cost plus" plan. The bonds, all of which bore 6 per cent interest yearly, were sold at 90, but the discount represented by that figure was actually increased by the cost-plus arrangement and other items, so that the District actually realized only $854.69 from each $1,000 bond it sold. Moreover, various costly mistakes were made in construction, which, added to the bond discounts and the very nature of the system as characterized by the several pumping lifts it involved, resulted eventually in accumulating a high per acre indebtedness against the lands, while the pumping increased considerably the other annual operation costs which, without them, would not have been light. The irrigation system was never fully completed as planned and many of the structures first installed were not of the permanent type.

The District took early advantage of the law by which the State guaranteed the bond interest for five years. The State's obligation under the guarantee expired with the payment of $2,250 for January, 1928, interest on the final bond issue, but this amount was only a small portion of the sum required to meet all interest requirements of that date, the remainder of which the District was thus obligated to produce. Meanwhile settlement and clearing of the cut-over and timbered lands which comprised a high proportion of the District's area, while proceeding faster than has been the case with most such projects, had not then approximated expectations upon which the District was founded and has still far to go, only 54 per cent of the irrigable area now being in production and capable of contributing to the District's treasury.

It became apparent in the fall of 1927 that the District would fail to meet the ensuing January bond interest installment, notwithstanding the operation of a so-called "trustee's agreement" entered into in September, 1925, which had the purpose of clearing up the delinquent tax situation as well as effecting the colonization of vacant lands. A meeting of the bondholders was held November of that year to consider this prospect, with the result that, at the joint request of the bondholders' committee organized at the meeting, and the Board of Directors of the District, the State Reclamation Commission caused a thorough investigation to be made of the affairs of the District. Based on the report which followed (by Messrs. Powers, McLaughlin, and Ewing) the bondholders' committee outlined the following plan of reorganization:

> "1. - Bondholders will accept refunding bonds of equal par value for those now held, the refunding bonds to bear interest at the rate of 2 per cent until January 1, 1934, and at the rate of 4 per cent thereafter until maturity. The bonds will mature serially, beginning with the year 1939 and ending with the year 1959.

"2. - The acceptance of this settlement by the bondholders will be contingent upon the State waiving entirely its claim for loans to the District, which with accrued interest now amounts to more than $450,000.

"3. - The District will agree to levy not less than $8.50 per acre each year against all irrigable land for a period of ten years and to use the surplus, over the requirements for the payment of principal and interest on its bonds and for ordinary operation and maintenance purposes, in necessary extensions and betterments of its irrigation system, which has been estimated by the committee's engineers to cost approximately $200,000."

The plan was accepted by the landowners of the District at an election by a vote of 446 to 2, and the owners of $1,400,000 of the total outstanding bonds of $1,460,000 deposited their bonds under its provisions. The actual exchange of bonds did not take place, but the new plan of interest payments was put into effect, and the District made three annual payments of 2 per cent each. However, in January, 1932, the bondholders' committee, because of poor markets and low prices for agricultural products, agreed to accept 1.3 per cent as a part payment of the 2 per cent annual interest, the balance to be paid when funds should be available. In June, 1932, the Directors of the District requested the committee to meet again in Grants Pass and confer with them regarding the 1932 assessments payable in 1933. The committee considered that, because of continued low prices and unsatisfactory markets for the District's products, the assessment should be reduced from $8.50 per irrigable acre, to $6.50, as a temporary expedient. This assessment was expected to produce approximately $37,000, and it was understood that the budget for 1933 would be reduced to an amount no larger than that, subject to unforseen emergency requirements, expenditures for which should be allowed only on approval of the State Reclamation Commission.

In February, 1931, the bondholders extended the time for the exchanging of refunding bonds until January, 1933. No further extension was arranged at that time, and in the ensuing spring months the necessity for some final adjustment of the situation, preferably by an entirely new financing operation, became apparent. This was in line with a recommendation made therein by the authors of the 1928 report and supported by Hydraulic Engineer E. B. Debler in a report made by him on September 24, 1932, at the request of the District and an association of the water-users, and addressed to the Chief Engineer of the United States Bureau of Reclamation. The authors of the 1928 report were convinced that any refunding undertaken in the face of the conditions even then present, or with the uncertain immediate future as a basis, could not be lasting but would soon have to stand revision; and they recommended that the obligations represented by the bonds be not disturbed for a period of five years beginning July 1, 1928.

While the proposed refunding has never been consummated, the unusually substantial proportion of the original bonds, represented in the holdings of the bondholders' committee and presumably assenting to it, has permitted the reduction of the annual interest obligation to be carried out without effective protest. However, a mandamus proceeding was

started in the courts some months ago by one of the few non-assenting bondholders to compel the levying of such assessments by the Directors of the District as would meet the interest nominally required to be paid. This action is now dormant, but is subject to revival. The District is involved in no other litigation, save such as is involved in foreclosure proceedings against lands delinquent in the payment of assessments.

Climate

The District is remarkably free from hail, winds, lightning, or violent storms of any kind. Lightning sometimes does damage to timber in the surrounding mountains, but it is almost unknown in the valleys. There is a relatively long growing season of warm sunny weather which makes it possible to produce small fruits and flowers for the early market, and, in part, No. 1 bulbs in a single season. While the seasons are fairly definite the climate is free from extremes and is relatively mild and healthful. The advantages of irrigation are obtained without the unpleasant features of more remote arid areas with attendant dust, wind and heat.

The mean annual temperature at Grants Pass is 53.3° F. Temperatures of 100° or more are common from June to September, inclusive, and temperatures of more than 70° have been recorded during every month of the year. Owing to the low relative humidity the high summer temperatures are not oppressive, while the nights are usually cool and refreshing.

Late spring frosts sometimes do damage to fruits, vegetables, and even general farm crops, but the occurrence is not frequent, and little provision is made for smudging orchards. The latest frost in the spring recorded at Grants Pass occurred on June 29, and the earliest in the fall, September 6. The average date of the last killing frost in spring is May 9, and the average date of the earliest in the fall is September 28. This gives a normal growing season of 142 days. Frost conditions vary somewhat in different parts of the Valley.

Details of Grants Pass climatic record are shown in Table 1 on the following page.

Transportation and Markets

The District is well supplied with transportation facilities, being traversed by the Shasta Line of the Southern Pacific Company, while the California & Oregon Coast Railroad, a local line with terminus at Grants Pass, extends 16 miles southwest of the city, running through a portion of the District, to serve mining and timber industries. For some years the lack of rail connection with sea transportation handicapped the industrial as well as agricultural development of the community, freight rates being unduly high. The surfacing of the Pacific Highway several years ago gave a measure of relief by encouraging transportation to nearby markets by motor-truck, and more recently this service has expanded rapidly with the improvement of the Ashland-Klamath Falls road, the Roseburg-Marshfield road, and especially the link of the Redwood Highway connecting Grants Pass with Crescent City, California.

TABLE 1. - Normal monthly, seasonal, and annual temperature and precipitation at Grants Pass. (Corrected to Dec. 31, 1932; record, 44 years.) Elevation 940 feet.

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1923)	Total amount for the wettest year (1909)	Snowfall average depth
	°F	°F	°F	Inches	Inches	Inches	Inches
Winter							
December	39.0	77	2	4.96	2.91	5.01	1.4
January	39.1	71	0	5.31	3.75	15.30	4.0
February	43.0	78	10	4.36	0.94	7.32	2.0
Spring							
March	47.4	86	15	2.95	0.44	1.09	0.6
April	51.7	98	20	1.81	1.54	0.14	T
May	57.6	101	24	1.41	1.02	0.29	T
Summer							
June	63.3	108	30	0.85	0.92	0.78	0
July	69.9	114	33	0.13	0.04	0.29	0
August	69.1	108	30	0.20	0.15	T	0
Fall							
September	62.1	105	24	0.91	1.43	1.03	0
October	53.8	99	20	2.09	2.79	3.39	0
November	44.6	76	12	4.45	0.99	9.19	0.5
Year	53.4	114	0	29.43	16.92	43.83	8.5

Latest killing frost in spring, June, 29; earliest in fall, September, 6.
Average killing frost in spring, May, 9; fall, September, 28.
Average time between killing frosts, 142 days.

Present railroad and auto freight line rates are as follows:

Southern Pacific Railroad Company

Car Load Rates

Grants Pass to Portland

Apples and Pears	28½¢	per Cwt.
Other Fruits and Vegetables	29½¢	" "
Grain	22½¢	" "
Strawberries (Express)	70 ¢	" "

Transcontinental

Apples	$1.50	per Cwt.
Pears	1.73	" "
Hops	1.75	" "

Grants Pass to San Francisco

Pears -	Export	32 ¢	per Cwt.
	Direct	38½¢	" "

Pierce Auto Freight Lines

To or from Portland: First class rate $1.29 Cwt; second class rate (including seed of any variety) $1.09 Cwt; third class rate $0.90 Cwt; fourth class rate $0.78 Cwt.

Grocery Commodity Rate, $0.70 Cwt. This rate includes practically all grocery supplies, also feed, fresh or dried vegetables, fresh or dried meat, dried fish, eggs, flour or meal, fresh or dried fruit, poultry (dressed), grain, canned fruit, or other canned goods, nuts, onions, potatoes, etc.

Building Material and Hardware Commodity Rate, $0.75 Cwt. This rate applies to practically all building material and hardware, including Stoves, Ranges, Stovepipe, Lumber, Ammunition, Rope, Sash, Shingles, Tinware, Sheetiron, Glassware (lamp chimneys, fruit jars, etc.), Shovels, Staples, Roofing Paper, Fencing, etc.

Helsley & Littrell Truck Line

To Crescent City

First Class	$0.65	per Cwt.
Second Class	0.51	" "
Third Class	0.46	" "
Fourth Class	0.40	" "
Minimum charge on anything under 100 lbs. -	0.25	

The passenger service of the railroad is competed with and supplemented by various automobile stage lines.

Market and other local roads within the District are excellent, and show a notable improvement, both in condition and in total mileage, over their status in 1928. This has been largely brought about by the recent road building campaign of Josephine County. The operation of the irrigation system has been much facilitated by the improvement of the roads, and the transportation of produce from the farms has been rendered a simple matter.

Population and Industrial and Social Conditions

The population of the District is estimated at 3200 persons, of which a portion live within the city of Grants Pass. The latter's 1930 population was 4,666. It is one of the most progressive cities of Southern Oregon, and because of scenic and other attractions is a favorite stopping place for tourists and sportsmen, especially in the summer months. The entire community enjoys modern telephone and electrical service; and 11 churches, three farmers granges, one high school, and eight grade schools are available to the inhabitants of the District.

Although the size of Grants Pass is not such as would ordinarily justify the term suburban, the farming community surrounding it has some of the characteristics of a city suburb. Relative to its area, in fact, the population of the District itself is somewhat larger than that of most irrigation-farming communities. The degree of prosperity enjoyed by the District accordingly affects an unusually large number of people. Many of these, while perhaps mainly dependent upon the products of the land for the necessities of their living, in normal times are able to supplement those revenues by earnings from various sources, not only those representing the industries of Grants Pass, but also notably the not far-distant lumber mills in Klamath Falls, Bend, and other centers. With most of the mills shut down until recently, and with other business stagnant, the farmers now have only their small acreages left to depend upon, and while these continue to supply the main essentials for mere subsistence, they provide only with difficulty, if at all, the cash needed to meet mortgage interest, taxes, irrigation district assessments and the like.

In the main, the farmers are white Americans. There are few, if any, Asiatics or Negroes. While depressed, as elsewhere, by current hard times, the standard of living still is higher than in most communities in a comparable state of development. In normal times home rental values might properly be taken into account at much higher levels than those now current. In fact, despite the price of fully developed land plus the District's bond obligation, the temperate climate and adaptability of the soil to a garden-poultry-dairy type of agriculture make possible the provision of a fairly complete living even on the small farms. Beyond this provision, of course, the limitations of the available markets constrict farm incomes severely, and the present morale of the farmers is not generally as good as in 1928.

Water Rights

The water rights of Grants Pass Irrigation District are described in Permit No. 8853 for not to exceed 230 second-feet of water, issued in partial compliance with Amended Application No. 5189, covering the appropriation of 345 second-feet of water from Rogue River and various tributaries, in the amounts indicated: Rogue River, 300 second-feet; Savage Creek, 5.0 second-feet; Greene Creek, 3.0 second-feet; Fruitdale Creek, 5.0 second-feet; Allen Creek, 6.0 second-feet; Sand Creek 6.0 second-feet; Sparrowhawk Creek, 3.0 second-feet; Jones Creek, 6.0 second-feet; Skunk Creek, 3.0 second-feet; Gilbert Creek, 3.0 second-feet; Dutcher Creek, 3.0 second-feet. Except Rogue River, these are small streams which furnish some water for irrigation during the early part of the irrigation season but little or none during its major part. The filing also covers all seepage, drainage, and waste waters resulting from the irrigation of lands through the District's irrigation system.

Amended Application No. 5189 was received in the office of the State Engineer December 8, 1928, and was approved January 15, 1929; but since the original application (of the same number) was filed on September 29, 1916, the priorities date back to that year.

The oldest right on Rogue River is that held by the California-Oregon Power Company for the generation of power at Gold Ray. The amount of water adjudicated this right during the summer is 1060 second-feet. This water is returned to the stream and is available for use on Gold Hill, Grants Pass, and Fort Vannoy Irrigation Districts. On only a few occasions has the flow of Rogue River dropped below 900 second-feet, which is sufficient to supply all the lower rights including Grants Pass and Fort Vannoy Irrigation Districts.

The District was affected by the exceptionally low stages of the River in 1930 and 1931, but principally because the flow was not sufficient to operate the turbines at Savage Rapids dam to the capacity needed to supply the lands on both sides of the River. (See chapter headed "The Irrigation System.") A rotation was necessary between these areas during the emergency, and, by the periodical shifting of service, both areas were carried through the season without damage to crops.

The Irrigation System

The District's Rogue River water is all diverted at Savage Rapids dam, which spans the river approximately on the line dividing Josephine and Jackson counties, about 7 miles east of Grants Pass. This dam is of the multiple arch-and-gravity type, with 25 feet spans. A power house is on the north side of the river and the gravity canal intake on the south side. The height of the southern nine panels being less than that of the balance of the dam, they were constructed as a gravity section. The length of the dam proper is 400 feet, and the total length of the structure is 500 feet including 11 feet for canal intake, 41 feet for power house, 12 feet for fishway, and 36 feet for cut-off walls at both ends. The height of the dam is 24 feet above the downstream pavement and this can be increased 10 feet by the movable crest of the dam.

The dam was built as an overflow structure, its entire length being designed as a spillway, thus permitting the water to pass over it during all stages of the flow. Within each of the panels is placed a segmental gate, so constructed that when the gate is down the river flow will pass over the crest of the dam and the gates as well. The gates can be raised to maintain the water level above the dam at an elevation of ten feet higher than when the gates are in their lowest position. The gates are operated by hydraulic pressure.

The power plant which operates the pump at the dam consists of two horizontal double-runner turbines, operating under a head of 28 feet and requiring, theoretically, a maximum flow of 660 second-feet. One turbine is direct-connected to a 30-inch bottom suction centrifugal pump with a theoretical capacity of 67 second-feet against a head of 90 feet. This pump discharges through a 42 inch diameter pipe into the South High Line Canal. The other turbine drives two 24 inch centrifugal pumps connected in series and with a theoretical capacity of 40 second-feet against a head of 150 feet. These pumps discharge into the Tokay Canal through a 42 inch diameter pipe.

Only one of the canals heading at the dam receives water by gravity. This is designated the Main Canal, and extends westward on the south side of the river. The South High Line Canal, paralleling it at a higher elevation on the same side of the river, and the Tokay Canal north of the river, receive water from the turbine-operated pumps just described.

Relatively small areas north of the dam in Jackson County are included in the District. These lie on both sides of the river and are served by two canals, the one on the north side extending eastward from the terminus of the pipe line from the dam. The latter thus serves both the Tokay Canal which flows southward, and the Evans Creek Canal, which serves the Jackson County lands adjacent to the city of Rogue River. A similar junction is made with the pipe line from the dam across the river, one branch being the South High Line Canal which flows westward, and the other the Savage Lateral, which flows toward the east.

In addition to the pumping units at the dam, four other pumps are used to lift water to various portions of the District. These are all operated with electrical current purchased from the California-Oregon Power Company. Their descriptions follow:

The Demaray pump is the only one on the north side of the river. It is operated with a 125 horsepower motor, and has a capacity of 8 second-feet. The head is 110 feet, including friction. The pump discharges into a 24-inch wood-stave pressure pipe 400 feet long. The minimum annual power-consumption obligation represented by this outfit is $1,605. This unit was designed to serve 600 acres.

The Allen Creek pump is operated with a 200 horsepower motor, and has a capacity of 10 second-feet. The friction and static head is 141 feet. The pump discharges into 1,000 feet of 24-inch wood-stave pipe. The minimum annual power cost is $2,505. This unit was designed to serve 800 acres.

The Sand Creek pump is operated with a 150 horsepower motor, and has a capacity of 7 second-feet. (This outfit in 1931 replaced a 450 horsepower motor and a pump of 20 second-feet capacity.) The friction and static head is 154 feet. The pump discharges into 1,400 feet of 34-inch wood-stave pipe. The minimum annual power obligation is $1,905 (former outfit charge: $5,230). This unit was designed to serve 1,600 acres.

The Jerome Prairie pump is operated with a 250 horsepower motor, and has a capacity of 20 second-feet. The friction and static head is 90 feet. The pump discharges into 1,500 feet of 34-inch wood-stave pipe. The minimum annual power obligation is $3,105. This unit was designed to serve about 1,600 acres.

The following summary (Table 2) shows the lengths of canals, flumes, and pipe-lines, for the entire system:

TABLE 2. - Summary Description of Canal System of Grants Pass Irrigation District

Name of Canal	Canal Length	Flume		Pipe	
		No.	Length	No.	Length
	Feet		Feet		Feet
Main Canal	70,000	3	304	2	5,000
North	2,870			2	5,987
Tokay	63,800	1	600	3	2,045
South High Line	102,700	1	450	3	680
Evans Creek	24,812	1		1	1,732
Allen Creek	34,900	1	500		
Sand Creek					
1. Chicago Lateral	29,210				
2. Wylberg Lateral	11,600				
3. Carns Lateral	12,500	1	120		
Jerome Prairie	49,625	3	250	1	3,500
Demaray	24,615	3	100		
Total ft. length of ditches under pumps	162,400	7	470		3,500
Name of Lateral					
Annis	800				
Allen	670			3	625
Carter	14,625	3	180		
Gunnell	6,000				
Hamilton	2,200			1	455
Hillside	14,778	2	172	1	4,300
Jones Creek	5,052	1	272		
Leigh	5,600			1	760
Middle	4,900	1	410		
Park Street	4,376	3	726	1	27
Riverside	7,825	5	1,965	1	
Savage	8,100	1	80		
Seebach				1	400
Ward	13,000	2	600		
State	6,990	6	1,900		
Brooks	8,160				
Grant	1,550	1	180		
House	4,200	2	2,264		
Ashfield	1,150				
Jenkins	2,620	2	1,385		
Nash	5,550				
Glazier	1,340	7	830		
Boynton	4,200				
Total feet	550,318		13,288		25,511

Distribution of Acreage

The present acreage of the District is served by the system described in Table 1, in the units shown in Table 2.

TABLE 3. - Distribution of Acreage of Grants Pass Irrigation District, by units.

Unit	Total Irrigable Area	Irrigated Area	Irrigable Area Occupied but not Irrigated	Unoccupied Irrigable Area
	Acres	Acres	Acres	Acres
Demaray pump	454.9	363.6	24.4	66.9
Allen Creek pump	738.0	256.0	214.3	267.7
Sand Creek pump	1,448.6	317.5	36.6	1,094.5
Jerome Prairie pump	1,637.3	658.2	302.9	676.2
Total, pump units	4,278.8	1,595.3	578.2	2,105.3
Main Canal	2,817.2	1,559.3	612.5	645.4
Northwest Unit	1,074.0	811.7	224.3	38.0
South High Line	1,840.3	1,033.3	335.3	471.7
Tokay Canal	2,020.6	1,331.6	202.9	486.1
Evans Creek	448.0	414.8	33.2	0.0
Savage Lateral	112.4	59.5	1.5	51.4
Total, gravity units	8,312.5	5,210.2	1,409.7	1,692.6
Total Irrigable Area	12,591.3	6,805.5	1,987.9	3,797.9

Present Condition of the System

When the District was visited by the author of this report in April, 1928, a survey of the physical condition of the works was being made by Charles E. Stricklin, then Assistant State Engineer and now State Engineer. As a result of his examination, Mr. Stricklin outlined a program of reconstruction and reconditioning for the system which he estimated would cost $232,119. (This was the estimate referred to in the agreement between the bondholders and the District later in 1928 and quoted in the Introduction of this report. Toward carrying out the program, the District was to use funds not required for operation and maintenance and bond interest obligations.) A flood in 1927 had torn out the suspension bridge at the dam and a pipe line which crossed from the south to the north side of the river just below Grants Pass. Excessive rains had also caused heavy slides in the Main Canal (south side), and at places where the South High Line Canal was only a short distance above the Main Canal, had brought about conditions

which threatened breaks disastrous to both. The character and relative position of these two canals are, briefly, these: The lower canal follows the river for a considerable distance below the dam, on a narrow ledge not far above the stream at its normal stage; thereafter for another considerable distance, while somewhat farther from the river, it extends, as in much of the preceding length, along the foot of a bluff which rises above it so precipitously that protracted rains have sloughed and may be expected to continue sloughing soil and debris into it in heavy quantities -- a process accentuated by seepage from the South High Line Canal where the two are in close proximity.

In 1928, supposedly at the time as a temporary expedient, the District threw a twin pipe across the river for the Northwest Unit lands, and cleaned the two south side canals as well as the remainder of the distributing system. Various minor structures have since been repaired or replaced, and some new ditches and flumes have been built to lands recently settled. The suspension bridge at the dam has not been and presumably will not be replaced, as it is not essential. In effect, the system was put in good operating condition, and a portion (estimated at 20 per cent) of the program involved in Mr. Stricklin's estimates has since been carried out. In fact, in 1933 the general physical condition of the entire system appeared to be better than in 1928, with the exception of the Savage Rapids dam. Many of the old wooden structures have been replaced during the past three years, with concrete, 7,444 feet of wooden flume has been replaced by metal flume on concrete footings; and 10,603 feet of small laterals have been concrete-lined to overcome both seepage and erosion. In addition 1200 feet of dangerous hillside lower bank on the South High Line Canal was concrete-lined, overcoming the danger of bad breaks and seepage. A recent measurement of water in the South High Line Canal while running a full head, shows a loss of 15.2 second-feet, through seepage in the first four miles from the Savage Rapids dam. Concrete lining along the worst sections of this canal would conserve a great deal of water.

The District still continues to use the 400 feet of pipe lines serving the Northwest Unit. These pipes are placed across Rogue River each season before April 1 and removed after October 1, at a cost of about $250. This is an operation with considerable risk attached to the workmen doing it, and there is also danger of losing the pipe line through high water after April 1. The logical place for this pipe line would be below the channel of the river. It could be so installed without very heavy expense during an autumn when the water stage of Rogue River is low.

The extensions of all canals and laterals planned to serve the present acreage in the District have been completed.

Substantial repairs are needed on Savage Rapids dam, in addition to the restoration of the two gates which were taken out during the flood of 1927 and which have not been replaced as yet. Two more gates were put out of commission during the high water of the spring of 1932. These two gates are still in place, but their hinges are broken off and the concrete piers have been broken through; also the jack stems on the gate are badly damaged. The District has been timbering up these four openings with 12 by 12 timbers each season. This is quite an undertaking and involves

considerable expense. The twelve remaining gates are raised with some difficulty, the raising of two or three of them necessitating the use of a heavy hand screw-jack, apparently because of the out-of-balance condition of the gates which causes them to bind on one side or the other, and the bent condition of the jack stems coupled with some leakage in the hydraulic pipes and apparatus. Owing to these defects it is difficult to get up sufficient pressure to raise the gates without an undue amount of work and risk, especially when water is high in the river. Manager Fosbery estimates that it would cost $15,000 or $20,000 to put the Savage Rapids dam in first class shape. Minor repairs could be accomplished for possibly half the amount, putting the dam in fair operating condition. The pumps and turbines are in good condition and operating efficiently.

The four pump lifts are still in operation, but the total annual minimum power charge has been reduced from $12,800 to $9,120. The most of the reduction in the minimum charge was accomplished through the change to a smaller pumping unit for the Sand Creek lift: The old 18 inch pump and 450 horsepower motor were replaced at the beginning of the 1931 season by an 8 inch by 10 inch pump and 150 horsepower motor, this equipment being large enough to take care of all of the area under cultivation and making a saving of $3,305 on the minimum power charge. Development work done in the Demaray, Allen Creek and Jerome Prairie units during the past five years has produced a fair percentage of new settlers, especially under the Jerome Prairie pump. Settlement under the Sand Creek pump has not been encouraged because of the checker-board nature of the present settlement, the high pump lift, and the high cost of operation of the plant.

Classification of Soils[1]

The report of the Soil Survey of Josephine County, Oregon, by the United States Department of Agriculture, Bureau of Soils, and Oregon Agricultural Experiment Station cooperating was used as a basis for judging the soils of the Grants Pass Irrigation project.

A study of the project shows that some of nearly all the soil types of the county are found within the boundaries of the project. The Bureau of Soils' classification is in general as follows:

Classification of Josephine County Soils. The country rock and the geological development of the unconsolidated soil material are important considerations in soil classification. The soils of the County are divided into three groups; namely, (1) the residual soils of the upland, from primary and secondary igneous material, (2) the old valley filling soils, alluvial fans and terraces of mixed material, and (3) recent river and stream bottoms of mixed alluvial material. These groups are divided into soil series having similar geological origin, topography, color, lime content, natural drainage, structure and soubsoil conditions; e.g., Siskiyou series, called "granitic." Each series may contain a number of types which are similar in respect to the foregoing qualifications, and differ only in texture; e.g., Aiken silt loam, Aiken clay loam, etc. The following key shows the soil series established in Josephine County,

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[1] From 1928 report.

with their distinguishing characteristics and their relation to the country rock.

Key to Classification of Josephine County Soils

I Residual Soils

(a) From igneous rock

Siskiyou - Gray soils or gray to brownish red subsoils.

Holland - Brown to reddish brown soils on brown to red subsoil.

Aiken - Red surface soils on red subsoils.

Olympic - Brown surface soils on brown subsoil.

(b) Sedimentary shales and sandstone.

Sites - Red soils on red subsoils.

Melbourne- Brown soils on yellow to reddish yellow and brown.

Hugo - Brown to grayish and reddish brown on lighter color subsoil.

II Old Valley Filling Soils

(a) Mixed material

Corning (Esterly) -- Tokay is included in Corning. Red soil on red subsoil, heavy, compact gravelly substratum.

Kerby - Brown soil on gravelly yellow to reddish brown subsoil.

Clawson (Grants Pass) -- Gray to brownish gray soil on gray to drab heavy and compact subsoil. Poor drainage.

Jerome - Gray soil to light brownish gray on gray to drab heavy and compact subsoil. Poor drainage.

(b) Sedimentary rocks

Arago (Selma) - Brown, moderately compact, on yellowish and reddish brown, also fairly compact.

(c) Igneous rocks

Wind River (Josephine) - Brown to reddish brown soil on brown to reddish brown subsoil, moderately compact.

Barron - Gray soil on gray to reddish brown or yellow brown compact subsoil.

III Recent Soils -- Mixed Material

Columbia - Brown soil on brown friable subsoil.

Wapato - Brown soils on gray brown soils, poorly drained.

IV Miscellaneous Soils

Rough Stony

Rough Mountain

River Wash

Placer Diggings

The present classification is an appraisal of the various lands within the project for irrigation purposes. Particular attention is given to topography, drainage, and origin of the soil. A total of six classes is made, and numbered consecutively.

Class 1 is the Columbia series, located along Rogue River. Much of it is a sandy loam, and of excellent quality.

The Kerby, Corning, Aiken, Olympic, and Sites are also good soils, sometimes only of little lower value than the Columbia series, and are placed in Class 2. Other soils are usually of lower value due to poor drainage, rough topography, or coarse texture. Jerome, Clawson, and Wapato are especially in need of drainage and quite frequently have a layer of heavy texture beneath the surface, making it difficult to drain.

Soils placed in Class 3 are usually so classified because of poor drainage or because of rough topography. In nearly all cases the wet land can be drained and the rough land may be leveled for irrigating, but the additional expense involved will be necessary to put them into satisfactory shape.

Class 4 consists for the most part of undeveloped brush land. Most of such land is rather broken and the combined expense of clearing and leveling will be high. Much of this class is in the Siskiyou soil series.

Class 5 includes only wet land which is non-productive because of lack of drainage. When drained such lands often are quite productive and usually prove satisfactory farm land.

Class 6 is land which is eliminated because it is too steep or rocky or sandy to be of any great agricultural value. Knolls so classed may in special cases be used for building sites or chicken runs where irrigation is not required.

The accompanying map exhibits the location and extent of the areas included in the classifications just described, while they are summarized in Table 4.

Summary of Irrigable Areas

Considering Classes 1, 2, and 3 as comprising the acreage economically susceptible of irrigation under present conditions, the District's irrigable area is 12,436.3 acres.

TABLE 4. - Soils acreage of Grants Pass Irrigation District

Location			Soil Classes					
Sec.	Tp.	R.	1	2	3	4	5	6
			Acres	Acres	Acres	Acres	Acres	Acres
10	36S.	6W.	4.2	11.9	11.1	8.7	4.2	
11	36S.	6W.		14.6	2.2			
13	36S.	6W.	172.4	206.6	14.8	58.7	34.1	4.6
14	36S.	6W.	140.2	169.2	92.0	70.8	1.8	28.3
15	36S.	6W.	36.0	35.7	10.6		2.4	0.1
20	36S.	6W.	33.0	36.9	35.4			34.0
21	36S.	6W.	4.6	328.1	36.2	12.1		6.4
22	36S.	6W.	26.5	419.8	96.1	1.2	12.2	9.3
23	36S.	6W.	7.3	538.0	73.3		2.1	6.1
24	36S.	6W.	189.4	241.1	130.7		4.7	12.3
25	36S.	6W.		196.0	75.2	18.4	6.1	11.1
26	36S.	6W.	457.8	82.8				66.1
27	36S.	6W.		151.9	93.4	48.6		82.3
28	36S.	6W.		125.0	55.5	72.8		28.9
29	36S.	6W.		136.5	79.9	72.3	7.3	65.3
30	36S.	6W.			4.1			1.9
31	36S.	6W.		44.2	16.8	8.1		17.0
32	36S.	6W.		352.0	86.7	97.7	16.5	76.6
33	36S.	6W.		206.5	100.0	8.0		
34	36S.	6W.		207.5	89.5	84.9		
35	36S.	6W.		221.3	116.1	69.2	20.7	
36	36S.	6W.		148.6	176.8	0.8		4.0
1	37S.	6W.		123.3			5.3	
3	37S.	6W.		88.8	36.5	47.0		6.0
4	37S.	6W.		121.7	89.6	55.4	19.3	
5	37S.	6W.		119.8	23.6	46.7		
5	36S.	5W.		73.8				1.1
6	36S.	5W.		81.9	61.9			10.2
7	36S.	5W.		212.5	48.7	5.3		2.1
8	36S.	5W.		390.2	156.8	17.9		16.5
9	36S.	5W.		12.8	8.9	3.4		2.2
15	36S.	5W.		36.8	53.1	6.5		
16	36S.	5W.		117.1	246.8	49.7	1.5	16.1
17	36S.	5W.		106.8	290.7			
18	36S.	5W.	9.8	37.4	120.5	16.5		5.1
19	36S.	5W.	148.9	264.3	58.2	5.7		4.6
20	36S.	5W.	214.1	286.7	30.6		3.7	10.3
21	36S.	5W.	200.6	137.6	93.5	44.4	1.4	18.2
22	36S.	5W.	116.3	63.4	44.2	15.6		19.8
23	36S.	5W.	75.4	97.6	52.7	35.8		25.1
24	36S.	5W.		73.7	48.2	36.2		
28	36S.	5W.		79.9	11.5	3.9	3.0	
29	36S.	5W.		184.4	33.0	4.7		
30	36S.	5W.		201.7	72.4	20.3		
31	36S.	5W.		135.2	72.4	12.1		
3	36S.	4W.		33.4				
4	36S.	4W.		37.4	10.8	17.0		
9	36S.	4W.	16.5	4.3	3.6	12.9		2.7
10	36S.	4W.	39.6	12.8	23.7	11.6		21.9
15	36S.	4W.	18.7		12.6			5.7
16	36S.	4W.	144.6	12.0		30.0		10.3
19	36S.	4W.			7.4			
21	36S.	4W.	7.5					
22	36S.	4W.	56.2	40.7	8.6	5.3		
29	36S.	4W.		45.0				
30	36S.	4W.		59.1	33.5	1.3		
Totals			2119.6	7166.3	3150.4	1137.5	146.3	632.2

The soils of the project as a whole are of good fertility. The following analysis of typical soils of the principal types (Table 5) shows their composition in essential elements of plant food.

TABLE 5. - Fertility in Josephine County Soils

(Analysis by Department of Agricultural Chemistry, Oregon Experiment Station)[1]

Soil Type	Nitrogen	Phosphorus	Potassium	Sulphur	Calcium
Residual Soils -					
Siskiyou, coarse sandy loam	640	3,400	42,000		
Aiken clay loam	2,200	920	13,200	154	75,800
Holland, coarse sandy loam	1,340	4,200	36,800		46,600
Old Valley Filling Soils -					
Kirby loam	2,000	1,920	16,800	180	58,400
Columbia loam (Colman)	3,200	960	33,000		72,600
Corning Clay loam (Tokay)	1,160	960	11,200	140	39,000
Corning gravelly loam (Esterly)	5,500	2,780	20,400		17,200
Kirby gravelly loam	1,380	1,580	24,600		24,200
Clawson clay loam (Grants Pass)	1,900	240	11,200	220	70,600
Corning gravelly clay loam (Esterly)	1,820	3,580	24,000		39,000
Barron coarse sandy loam	500	380	38,200		40,800
Columbia gravelly sandy loam (Colman)	900	3,840	23,400	600	73,400
Recent Soils -					
Columbia sandy loam	860	1,060	22,400		72,800

1/ The chemical analyses give an invoice of the total fertility calculated to pounds in the surface of an acre to a depth of 6-2/3 inches which is about the depth ordinarily turned with the plow, or 2,000,000 pounds.

Chemical analyses are not an unfailing guide to the use of fertilizers and should be used as suggestive of what should be tried in field tests.

The Columbia, Siskiyou, and Barron are three of the most extensive series of the project. The Siskiyou and Barron, both of granitic origin, are very low in nitrogen but quite high in potassium. These soils may prove especially suitable to growing crops of high potash demands.

The sulphur content of soils analyzed also is low, and farmers of the project who have used sulphur on clover or alfalfa report good results. It probably would not show as good results on the non-legumes.

Practically all Josephine County soils need humus and nitrogen. Crop rotation and use of manure on these soils is very profitable, especially under irrigation.

Acid phosphate used at the rate of 160 to 200 pounds an acre applied before seeding down in spring and thereafter in the fall or before renovation should pay well. Legumes on soils well supplied with phosphorus may be treated with 100 pounds an acre of flowers of sulphur once in four years. Gypsum is helpful on clover and alfalfa.

Cereal or row crops after non-legumes may be benefited by adding nitrogen as well as phosphorus, nitrate being used at the rate of 100 to 200 pounds an acre.

The analyses show that nearly all the soils of the project are well supplied with calcium, the essential element of limestone. Field tests show, however, that many of the soils of the project are slightly acid. Any extensive use of sulphur would tend to increase the acidity and in time might make it necessary to use ground limestone to correct the condition.

The intensified type of farming being developed on the project, such as the growing of bulbs, berries, grapes, orchard fruits, and garden truck, will justify the extensive use of commercial fertilizer, as more knowledge is gained from experience with the various crops.

Topography and Drainage[1]

The project is free from soil alkali and because of climatic conditions should remain so. A high water table which is aggravated by excessive irrigation is not accompanied with all the ill effects following such conditions in a drier climate. However, thorough drainage of the wet areas is essential to their successful development under irrigation practice. All areas indicated as wet in the classification are in need of tile drainage. A reduction in the amount of irrigation water used would no doubt aid in improving drainage conditions. Drainage is an outstanding need of the project at the present time.

However, in portions of the District economical use of water is difficult to effect because of the topography. Unfortunately it is these sections to which water must be raised by the pumps. While the country immediately below Grants Pass on the north side of the river -- the so-called Northwest Unit -- is quite flat and the fields are fairly level, much of the land elsewhere which has been classed as irrigable is characterized by steep slopes; or if not of that character, it is undulating, with swales and depressions which necessitate the use of flumes in conveying the water, and of considerable labor in distributing it, especially if a thorough job of grading and leveling is not attempted when the fields are first laid out. These swales in many cases need drainage to protect small areas of berries, legumes and other crops which are injured by shallow water table. In some low areas drains of

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1/ From 1928 report.

fair depth will prevent growth of water-loving vegetation and permit growth of ladino clover for pasture or seed. Tile drainage below unstable sections of the High Line Canal bank should help stabilize the soil and lessen slippage into the Low Line Canal in the upper part of the system.

Clearing and Leveling

The work of preparing the land for irrigation in this District is a difficult, tedious, and costly operation. Where light timber is still standing on the land its salvage may go part if not all the way toward paying for its removal, but stumps and brush do not offer this opportunity; moreover, not much timber remains. Small stumps of pine or fir can be removed quite easily by a team of stout horses, but the larger stumps, especially those of oak, must be pulled by stronger means or burned or blown out with powder. An effort was made in 1928 to ascertain the average cost of clearing land. Only a few estimates based on even approximate accounts of expense could be obtained, but from such as were offered it appeared likely that, where stump land was involved and the work was done in fairly large units -- that is, say twenty acres -- $50 to $60 would remove the stumps and brush. If the work were undertaken by the settler himself, and the usual interruptions and handicaps be taken into account as well as the frequent lack of suitable equipment and capital, $100 an acre would have come nearer the cost, his time being charged for at rates he would have to pay hired labor. Such leveling as is done costs from about $5 to about $15 an acre. A comment of general applicability throughout the District is that more thorough leveling would save labor and water in irrigation. Taking into account reductions in wages and other costs since 1928, on the average about $65 to $100 is not too high as representing the cost of putting stump and brush land in good condition to be irrigated.

The cultivated area of the District has increased since 1925 by about 300 acres a year, which probably represents also the progress of clearing. This has practically all been done by individual effort, except for a plan adopted by Josephine County in 1931, $4,000 of county funds then being set aside to pay for the clearing of lands in the District owned by the county. This was a part of the campaign to provide work for the unemployed.

PART II.

THE FARMING SITUATION

Size of Farm

In the face of the generally depressed circumstances of agriculture throughout the Nation in recent years, which in many sections has resulted in an abandonment of farms rather than an increase in their number and area in cultivation, the performance of Grants Pass District in effecting a steady development of its area would be remarkable even if its own economic position had been excellent -- which has not, of course, been the case. Nevertheless, development has only been rapid enough to bring a little more than half the irrigable area into production, the practical result being that only that proportion of the lands are now in a position to help toward meeting the obligations which stand against the entire area.

The increase in the number of water users has been even more remarkable than the increase in acreage, but this has complicated the agricultural situation, rather than simplifying it. The average size of the farms is now only 6½ acres, if certain tracts within and adjacent to the city of Grants Pass are taken into account. As this average is a substantial reduction from that of a few years ago, it is apparent that many of the larger holdings of former years have been divided. Thus the tracts averaging from 1 to 2½ acres increased from 137 in 1927 to 518 in 1932. The corresponding increase of the 2½-to-5 acres group was 251, and that of the 5-to-7½ acres group, 102. On the other hand, units of the 30-to-40 acres group declined from 74 to 23; those of the 40-to-60 acres group, from 47 to 10; those of the 60-to-80 acres group, from 17 to 1, etc. There is now only one tract of more than 80 acres. The complication resulting from this subdivision is, that the burden on the land is much increased, rather than diminished, if it is expected to produce the living of the occupants and meet the other obligations of the community.

Table 6 shows a distribution of the District's assessed area by sizes of tracts, in 1922, 1927, and 1932, together with other pertinent information.

TABLE 6. - Sizes of Tracts Assessed by Grants Pass Irrigation District for Years 1922, 1927 and 1932

Size of Units, in Acres Assessed

0 to 1	1 to 2½	2½ to 5	5 to 7½	7½ to 10	10 to 15	15 to 20	20 to 30	30 to 40	40 to 60	60 to 80	80 to 90	Over 90 Acres
Number of Units of Different Sizes												
1922												
221	137	118	55	59	51	55	66	74	47	17	5	10
1927												
317	212	295	117	274	110	99	85	36	16	3	1	1
1932												
228	518	369	157	318	125	91	70	23	10	1	1	0

Total number of tracts in 1922, 915; in 1927, 1566; in 1932, 1911.

1930 Crop Report shows 6,169.3 Acres Irrigated and 952 Water Users.
1931 Crop Report shows 6,413.9 Acres Irrigated and 1,019 Water Users.
1932 Crop Report shows 6,805.8 Acres Irrigated and 1,068 Water Users.

Number of tracts within city limits of Grants Pass, 298; area, 1,013.4 acres.
Number of tracts used for residential purposes, 452; area, 922.3 acres.
Number of tracts within city limits of Grants Pass classified as residential, 257; area, 598.8 acres.

Type of Farming and Crop Census

To produce crops that would bring forth a living for the farm family and furnish capital for further development has been the constant problem. This with a small average holding meant early concentration on intensive crops. Gradually truck crops and strawberries established themselves. At first the local market handled the production, but soon additional markets had to be secured. Improved highways made it possible to reach such nearby markets as Klamath Falls and Marshfield, Oregon, and Crescent City, California. An overnight truck haul brought perishable products to market in good condition, and were prices better and the market unlimited the future of the District's farming would hold much promise.

TABLE 7. - Acreage, Average Production, per acre, and Average Selling Price, per unit, of Principal Crops Raised in Grants Pass Irrigation District, 1930, 1931, and 1932.

Crop	Acreage			Average Production, per acre			Average Selling Price, per unit		
	1930	1931	1932	1930	1931	1932	1930	1931	1932
Grain (Hay)	144.20	111.60	183.70	2 Tons	2 Tons	2 Tons	$8.00 in field	$6.00-7.00 in field	$6.00-7.00 in field
Alfalfa	653.30	690.30	595.60	4½ Tons	4½ Tons	4½ Tons	$9.00 in field	$7.00 in field	$7.00-8.00 in field
Berries	195.40	270.10	280.10	2 Tons	2 Tons	2 Tons	$150.00	$150.00	$75.00
Clover	2,929.70	2,293.20	2,843.20	4 Tons	4 Tons	4 Tons	$9.00 in field	$7.00 in field	$7.00 in field
Corn	166.30	155.80	191.95	12-15 Tons ensilage	12-15 Tons ensilage	12-15 Tons ensilage	$4.00	$3.00	$2.50-3.00
Garden	626.80	612.70	785.07	Per acre	Per acre	Per acre	$150.00	$125.00	$125.00
Bulbs	264.60	207.00	162.75	50,000 Saleable	50,000 Saleable	Av. 50,000 Saleable	$10.00 Per 1,000	$10.00 Per 1,000	$4.00 Per 1,000
Orchard	439.80	445.90	378.35	5 Tons	5 Tons	5 Tons	$25.00	$20.00	$15.00
Potatoes	23.80	31.40	20.00	100 Bu.	100 Bu.	100 Bu.	$ 1.00	$ 0.60	$ 0.40
Vineyard	54.30	50.20	40.00	200 lugs	200 lugs	200 lugs	$ 0.75	$ 0.75	$ 0.50
Pasture	573.40	1,515.40	1,285.27	2 Cows Per A for 8 months	2 Cows per A. for 8 months	2 Cows per A. for 8 months	$ 4.00 Per month	$ 4.00 Per month	$ 4.00 Per month
Tomatoes	--	16.00	39.00 1/	--	5-10 Tons	5-10 Tons 4 Tons 2/	--	$ 0.75 Per 100 lbs.	$ 0.75 Per 100 lbs. $ 2.00 Per 100 lbs. 2/
Hops	14.00	14.00	14.00	2,000 lbs. Per acre	2,000 lbs. Per acre	2,000 lbs. Per acre	$ 0.14 Per lb.	$ 0.14 Per lb.	$ 0.14 Per lb.

1/ Includes string beans.
2/ This item is for string beans.

		1930	1931	1932
Total area irrigated	(Acres)	6,805.84	6,413.60	6,121.6
Total value of crops	(Dollars)	525,962.50	753,835.10	686,682.20

However, acreage in the various crops has shown recent important shifts and fluctuations, principally by the increase of the pasture, hay, and sileage crop acreages probably attributable to the increasing importance of dairying, and by the contraction of the acreage in bulbs, which were attracting much attention in 1928 but which have since not been generally profitable. Unfortunately, by no means all of the District is suited to the growing of crops of high value. This is brought out by the figures representing the crop censuses which the District conducted in 1930, 1931, and 1932. These are reproduced in Table 7.

During the past three years market conditions were such that, for the perishable crops (garden produce, fruits and grapes, bulbs, etc.), while the values given were an average for the amount actually sold, a great deal of the production was not saleable because of lack of market demands, and the acreage return as shown in Table 6 was not actually realized by the growers; hence the returns per acre in many instances were not nearly as large as the table would indicate.

Practically all the alfalfa and pasture crops go to the production of butter fat, and there is a tendency gradually to increase the number of good cows. Ladino clover has been found to do extremely well, while the acreage adapted to production of alfalfa is limited, largely by reason of a high water table in parts of the District. Some dairymen have found it possible to produce good ladino hay, which has boosted the feasibility of dairying materially. In brief, the general trend of recent years has been away from the crop specialties about which there was much enthusiasm in 1928, and toward dairying and such diversified farming as is possible on farms so small as those characterizing the District.

Poultry (chickens) in commercial flocks are numerous, and the increase in the number of turkeys has been marked since 1928. The approximate number of farm animals and the returns for them are given in Table 8.

TABLE 8. - Census of Live Stock in Grants Pass Irrigation District

Kind	Number	Estimated Annual Total Returns
Dairy Cows	1,698	$67,920
Hogs	100	800
Sheep and Goats	None	
Poultry, other than turkeys	10,000	7,500
Turkeys	20,000	50,000

Farm Ownership and Tenure

The Federal Census of irrigation of 1930 reported that 90 per cent of the irrigated farms in Josephine and Jackson Counties were farmed by their owners or managers, the remainder 10 per cent by tenants. The percentage for Grants Pass District is even higher for the first group, the District's manager estimating that only 2 per cent of the farms are operated by tenants.

These figures need some qualification, however, because of various large ownerships of a temporarily public nature. Thus the District itself has title to 713.42 irrigable acres, acquired through tax foreclosure proceedings, and holds delinquent tax certificates against 4,239.36 other irrigable acres. In addition, it has a considerable equity in 518.93 acres which it sold under contracts not yet paid out. Lands held by H. D. Norton, Trustee, now total 407.10 acres[1]; Josephine County owns 440.20 acres; the State of Oregon owns 57.10 acres; and the United States owns 560 acres. As the District has been following the policy of foreclosing, and of selling the lands upon which it forecloses as fast as buyers can be obtained, it is apparent that an acreage relatively large in total is either not held by individuals at all or that their tenure of it is not secure. Other acreages listed above may or may not be for sale, as various contract arrangements are operative by which titles will not pass to purchasers now on the land until their contract obligations are paid out. Likewise, much of the land sold under contract by the Chicago Land Company and other firms or individuals whose former holdings have been subdivided, still stands of record in the names of the original holders, but the farmers do not have the status of tenants.

A notable complication in the tenure situation is represented by certain homesteaded lands. These so-called "revested" lands, originally included in grants to the Oregon and California Railroad Company, which were recovered by the government and homesteaded within recent years. When the District was formed a considerable area within its boundaries was represented by these revested lands, and title to 560 acres still

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[1] As an outcome of the delinquent tax situation, which began to cause serious concern in 1925, the "trustee's agreement," which was reproduced and discussed in full detail in the 1928 report, was formulated. Judge H. D. Norton was named Trustee, while the Anglo-London Paris Company and Ralph Schneelock Company, representing bond-holding creditors, were named parties of the first part; Chicago Land Company was party of the second part; and the District was party of the third part. The principal purpose behind the trusteeship was to set up the machinery by which the creditors could buy delinquent tax certificates and thereby make available funds by which the District could meet its interest payments. It did not bring about that result to the extent hoped for, and lately has been inoperative because of the enactment of legislation which has enabled the District to obtain delinquent tax certificates (and effect foreclosures) without having to put up cash for them. When the District was visited in June of 1933 it was anticipated that the trusteeship would soon be dissolved and the lands held by the trustee transferred to the District or other disposal made of them.

remains with the government although it is understood that none of it is unentered. Although unentered land in such a situation is not subject to tax sale and the United States does not become obligated for assessments, nevertheless these charges constitute a lien against the land which must be removed before entry is allowed. Entered but unpatented land may be sold for taxes, in which case the purchaser assumes the rights of the original entryman.

Farm Valuations

The range of land values in the District is somewhat wide, as would be expected from the fact that much of it is still in brush while other parts have been farmed for many years and are well improved and highly productive. Variation in prices is also governed by location as to main highways and nearness to town. Lands held for sale by the District are carried on the latter's books at an average valuation of $57 an acre. Lands on which it holds tax delinquent certificates are given in similar valuation of about $33 an acre; and sales are made at these averages. Higher values are applied by local realtors to cleared lands well located on the main highways, while the productive and well improved farms in the older sections are held at values running up to several hundred dollars an acre. The average 1930 value of irrigated farms in Josephine County, as reported by the Federal Census, was $95.50 per acre, including land and buildings. The corresponding figure for Jackson County was $118.42

Assessments made for taxation purposes give some clue to local ideas of values. They do not, of course, represent full valuations themselves. In both Josephine and Jackson Counties the assessed valuation is about 65 per cent of the supposed actual value, including everything but buildings. In Josephine County, non-tillable land is assessed upon valuations running from $3.50 an acre to $20 an acre; tillable land from $25 to $120 in the country, and up to $250 an acre in the city of Grants Pass, according to location and character of the soil. Uncleared land is classed as non-tillable, but consideration is given to its possibilities. Buildings are assessed at 40 per cent of actual value. In Jackson County valuations on tillable land have ranged from $20 per acre to $80 per acre, for best bottom lands; uncleared tillable lands, from $10 to $40; irrigated pasture, from $3 to $10. Improvements are assessed at 50 per cent of actual value. Land valuations were practically unchanged for several years, but the current year's assessments are about 20 per cent lower than those of immediately preceding years. The 1932 assessment of taxable real property in the entire District ($854,137) suggests an actual value of around $1,300,000.[1]

1/ Rates of assessment in Josephine County vary in accordance with the location of the lands with reference to the city of Grants Pass and to the various school districts wholly or partly within the Irrigation District. There are seven of these. The 1932 Josephine County rates were made up as follows: County, 15.2 mills per $100 assessed valuation; city of Grants Pass (a portion only), 25.2 mills; road, 6.4 mills; high school (all District lands), 5.8 mills; district school, range from zero to 10.9 mills. The maximum rate was thus 63.5 mills, and the minimum 27.4 mills. The maximum 1927 rate was 70.6 mills, and the minimum 25.9 mills. A substantial reduction in the county rate has been made meanwhile; but the trend of the others, while not universally upward, have largely offset it. In Jackson County, the 1932 State and County rate was 14.0 mills, and the rates in the two school districts, 14.3 mills and 15.9 mills, respectively.

Farm Indebtedness and Credit

Exact information on indebtedness is extremely difficult, if not actually impossible to obtain, for the following reasons:

1. - Much of the indebtedness is represented, not by mortgages of record in the office of the County Clerk, but by purchase contracts not of record. When transfers of title are made, releases of such contracts are usually recorded, but until then the county books do not show them, and the facts can be ascertained only directly from the farmers themselves.

2. - Releases or curtailments of mortgage notes are frequently unrecorded.

In general it may be said that, while purchase contracts have been written in substantial numbers and amounts during the last several years, mortgages have not, for the reason that the present circumstances of the District's finances have rendered such financing inoperative because the bonds, in effect, are a prior lien against the lands and banks and other lenders are not willing to make the loans. Tax foreclosures have wiped out a considerable number of mortgages, and a few mortgage foreclosures have been made in recent years.

It is believed to be true that indebtedness represented by contracts and mortgages is lighter than that of most irrigation communities. The 1930 Federal Census shows, for Josephine County that 87 per cent of the total number of farms (irrigated plus dry) were operated by their owners, and of this number 44 per cent were "mortgaged". In Jackson County the corresponding percentages were 85 and 47. The Census definition of "mortgaged" does not make it clear whether contracts are covered, but it is believed that they are. The average mortgage debt, per acre, reported for Josephine County was $25.40, and that for Jackson County, $30.31. The latter figures, since they represent dry as well as irrigated farms, are probably too low when applied to the District's lands, but the percentages are believed to be about right. The ratio of debt to value, reported by the Census was 26.45 per cent for Josephine County, and 27.60 per cent for Jackson County, while the ratios of charges (interest, etc.) to debt were 6.17 per cent and 6.60 per cent. Both ratios had reference to "farms operated by full owners owning no other farm land." On the basis of these figures, it appears that the total mortgage (or contract) debt does not much exceed $160,000 and is probably somewhat less than that amount, and that the annual interest obligation is about $10,000. (These estimates are in reasonable harmony with the appraised value of the land and personal property in the District. The latter items, in 1932, were: taxable real property, $854,137; taxable personal property, $70,560.)

Most contracts written during the past five years have required payment by annual installments, over 10-year periods. Lands recently sold by the District, following their acquisition by tax foreclosure, have involved only four years. Payments on contracts of both types are, generally, somewhat in arrears, but contract foreclosures or cancellations are not being made in most cases, especially where the farmers are considered desirable, in the hope that an early improvement of economic conditions may permit either the readjustment or continuance of present

tenures. (This statement applies to the contracts written by the Chicago Land Company as well as the District and other sales agencies.)

Farmers in the District have not suffered materially from bank failures in recent years, no such failure having occurred in Grants Pass. The conservation of the Grants Pass banks, especially as it has been increased by the financial circumstances of the District itself, has somewhat restricted credit which might have been available otherwise, so that even chattel loans are not readily obtainable so long as livestock and commodity prices remain depressed. Such chattel loans as are made are for short periods and at interest rates ranging from 8 to 10 per cent per annum.

PART III.

THE FINANCIAL SITUATION

Present Status

The latest audit of the financial status of the District was made as of November 30, 1932. The balance sheet of this audit appears below as Table 9.

TABLE 9. - Balance Sheet, Grants Pass Irrigation District, November 30, 1932

A S S E T S		
CURRENT ASSETS:		
Cash and in Banks		$ 10,361.43
Notes Receivable		500.00
1931 assessments receivable		81,607.59
1930 delinquent certificates		39,663.42
1929 and prior delinquent certificates		94,878.57
1931 and prior Jackson County delinquent certificates		6,513.38
Foreclosed lands held for sale at appraised value	$ 40,420.00	
Less taxes due County on these lands	2,021.00	38,399.00
Land sales contracts receivable		15,096.55
TOTAL CURRENT ASSETS		287,019.94
PROPERTY ASSETS:		
Cost of irrigation system	1,364,528.23	
Land and buildings at dam	1,000.00	
Tools and equipment	5,593.20	
Office furniture and fixtures	427.82	
New construction since year 1928	42,513.62	1,414,062.87
TOTAL ASSETS		$1,701,082.81
L I A B I L I T I E S		
CURRENT LIABILITIES:		
Warrants outstanding	33,762.58	
Interest accrued on warrants	13,468.53	47,231.11
Accounts payable - Power company		23,821.26
Due County on its portion of delinquent certificates collected		567.85
TOTAL CURRENT LIABILITIES		71,620.22
DEFERRED LIABILITIES:		
Bonds payable	1,460,000.00	
Accrued interest on bonds (part delinquent) 1/	22,386.00	1,482,386.00
State loan	412,150.00	
Accrued interest unpaid, on state loan (4½ years) (No accrued interest has been added to this account for the past three years)	88,599.08	500,749.08
TOTAL LIABILITIES		2,054,755.30
DEFICIT		353,672.49
TOTAL LIABILITIES LESS DEFICIT		$1,701,082.81

1/ This accrual represents .7 of 1 per cent shortage in the last remittal of bond interest; and 2 per cent accrued from the last remittance date to November 30, 1932.

Present Bond Obligations

It has already been explained (in the chapter on Organization and History) that no actual change has taken place in the bonded obligations of the District as they stood when the 1928 report was written, notwithstanding the agreement between the bondholders' committee and the District under which interest payments have since been made. Legally, therefore, since no principal maturities have been met, the entire amount is still outstanding, as shown in Table 10.

TABLE 10. - Maturities of separate bond issues of Grants Pass Irrigation District

Year	First	Second	Third	Fourth	Fifth	Total
	July 1	July 1	July 1	Jan. 1	Jan. 1	
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
1929	16,000	-	-	-	-	16,000
1930	19,000	30,000	15,000	-	-	64,000
1931	22,000	32,000	16,000	-	-	70,000
1932	25,000	34,000	17,000	37,000	-	113,000
1933	28,000	36,000	18,000	40,000	-	122,000
1934	31,000	38,000	19,000	42,000	-	130,000
1935	33,000	41,000	20,000	45,000	-	139,000
1936	36,000	43,000	22,000	48,000	-	149,000
1937	38,000	46,000	23,000	51,000	-	158,000
1938	36,000	49,000	25,000	54,000	-	164,000
1939	-	51,000	25,000	57,000	-	133,000
1940	-	-	-	61,000	-	61,000
1941	-	-	-	65,000	-	65,000
1942	-	-	-	-	24,000	24,000
1943	-	-	-	-	25,000	25,000
1944	-	-	-	-	26,000	26,000

Tentative Refunding Plan

Table 11 shows the combined annual interest and principal-maturity obligation represented by the bonds listed in Table 10. Again it is to be noted that the maturities accruing up to and through July 1, 1933 ($385,000) have not been paid, while with the consent of the bondholders' committee, the annual interest payments for the first three years following the agreement were made at the rate of 2 per cent on the entire amount of bonds ($1,460,000), the payments thus being $29,200, while the fourth was made at the still further reduced rate of 1.3 per cent. The plan of refunding as contemplated originally was as shown in Table 12.

TABLE 11. - Total bond maturities and interest obligations of Grants Pass Irrigation District

Date	Amount of bond outstanding (including curtailments due)	Principal payments due	Interest payments due	Combined principal and interest payments due		Total annual obligations
				District	Per acre	Per acre
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
1928 Jan. 1	1,460,000 1/	-	43,800	43,800	3.48	
July 1	1,460,000	-	43,800	43,800	3.48	6.96
1929 Jan. 1	1,460,000	-	43,800	43,800	3.48	
July 1	1,460,000	16,000	43,800	59,800	4.75	8.23
1930 Jan. 1	1,444,000	-	43,320	43,320	3.44	
July 1	1,444,000	64,000	43,320	107,320	8.52	11.96
1931 Jan. 1	1,380,000	-	41,400	41,400	3.29	
July 1	1,380,000	70,000	41,400	111,400	8.44	11.73
1932 Jan. 1	1,310,000	37,000	39,300	76,300	6.06	
July 1	1,273.000	76,000	38,190	114,190	9.06	15.12
1933 Jan. 1	1,197,000	40,000	35,910	75,910	6.02	
July 1	1,157,000	82,000	34,710	116,710	9.26	15.28
1934 Jan. 1	1,075,000	42,000	32,250	74,250	5.89	
July 1	1,033,000	88,000	30,990	118,990	9.44	15.33
1935 Jan. 1	945,000	45,000	28,350	73,350	5.82	
July 1	900,000	94,000	27,000	121,000	9.60	15.42
1936 Jan. 1	806,000	48,000	24,180	72,180	5.73	
July 1	758,000	101,000	22,740	123,740	9.82	15.55
1937 Jan. 1	657,000	51,000	19,710	70,710	5.61	
July 1	606,000	107,000	18,180	125,180	9.93	15.54
1938 Jan. 1	499,000	54,000	14,970	68,970	5.47	
July 1	445,000	110,000	13,350	123,350	9.79	15.26
1939 Jan. 1	335,000	57,000	10,050	67,050	5.32	
July 1	278,000	76,000	8,340	84,340	6.69	12.01
1940 Jan. 1	202,000	61,000	6,060	67,060	5.32	
July 1	141,000	-	4,230	4,230	3.36	8.68
1941 Jan. 1	141,000	65,000	4,230	69,230	5.49	
July 1	76,000	-	2,280	2.280	1.81	7.30
1942 Jan. 1	76,000	24,000	2,280	26,280	2.09	
July 1	52,000	-	1,560	1,560	1.24	3.33
1943 Jan. 1	52,000	25,000	1,560	26,560	2.11	
July 1	27,000	-	810	810	0.64	2.75
1944 Jan. 1	27,000 1/	27,000 1/	810	27,810	2.21	2.21

1/ Including Bond No. 6 ($1,000), which matured July 1, 1924, but has not been redeemed or refunded. Interest was paid on this bond through the period ending July 1, 1927. This tabulation assumed that the obligation represented by Bond No. 6 would be discharged January 1, 1944, and that it would share with the other issues in interest payments intervening.

TABLE 12. - Grants Pass Irrigation District Plan of Bond Refunding
(Based on Assessable Area of 12,400 Acres)

Year[1]	Per Acre Levy	Gross Revenue	Construction and Contingency	Operation and Maintenance	Interest	Principal Retirement	Bonds Outstanding End of Yr.	Interest Rate
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Per cent
1929	8.50	105,400	46,200	30,000	29,200	-	1,460,000	2
1930	8.50	105,400	46,200	30,000	29,200	-	1,460,000	2
1931	8.50	105,400	46,200	30,000	29,200	-	1,460,000	2
1932	8.50	105,400	46,200	30,000	29,200	-	1,460,000	2
1933	8.50	105,400	46,200	30,000	29,200	-	1,460,000	2
1934	8.50	105,400	17,000	30,000	58,400	-	1,460,000	4
1935	8.50	105,400	17,000	30,000	58,400	-	1,460,000	4
1936	8.50	105,400	17,000	30,000	58,400	-	1,460,000	4
1937	8.50	105,400	17,000	30,000	58,400	-	1,460,000	4
1938	8.50	105,400	17,000	30,000	58,400	-	1,460,000	4
1939	9.50	117,800	9,400	30,000	58,400	20,000	1,440,000	4
1940	9.50	117,800	8,200	30,000	57,600	22,000	1,418,000	4
1941	9.50	117,800	7,080	30,000	56,720	24,000	1,394,000	4
1942	9.50	117,800	6,040	30,000	55,760	26,000	1,368,000	4
1943	9.50	117,800	6,080	30,000	54,720	27,000	1,341,000	4
1944	9.50	117,800	6,160	30,000	53,640	28,000	1,313,000	4
1945	9.50	117,800	6,280	30,000	52,520	29,000	1,284,000	4
1946	9.50	117,800	6,440	30,000	51,360	30,000	1,254,000	4
1947	9.50	117,800	6,640	30,000	50,160	31,000	1,223,000	4
1948	9.50	117,800	5,880	30,000	48,920	33,000	1,190,000	4
1949	9.50	117,800	6,200	30,000	47,600	34,000	1,156,000	4
1950	9.50	117,800	6,560	30,000	46,240	35,000	1,121,000	4
1951	9.50	117,800	5,960	30,000	44,840	37,000	1,084,000	4
1952	9.50	117,800	6,440	30,000	43,360	38,000	1,046,000	4
1953	9.50	117,800	5,960	30,000	41,840	40,000	1,006,000	4
1954	9.50	117,800	6,560	30,000	40,240	41,000	965,000	4
1955	9.50	117,800	6,200	30,000	38,600	43,000	922,000	4
1956	9.50	117,800	5,920	30,000	36,880	45,000	877,000	4
1957	9.50	117,800	5,720	30,000	35,080	47,000	830,000	4
1958	9.50	117,800	5,600	30,000	33,200	49,000	781,000	4
1959	9.50	117,800	5,560	30,000	31,240	51,000	730,000	4

1/ Payments due July 1.

Receipts and Disbursements

The District's source of income is from payments of assessments levied annually in the fall to carry on the necessary operating and financial requirements during the succeeding year. The assessments may be paid directly to the tax collector until such time as a certificate of delinquency has been secured by the District, in which even the amount of the assessment, together with delinquent general taxes, is paid directly to the District, the latter tax being remitted to the county. If the District forecloses on a certificate of delinquency and obtains title to the land, it is sold when possible for a price in line with its value, regardless of

whether it may be less or greater than the amount of the delinquent assessment. This is another source of income to the District and is in effect an indirect method of collecting an assessment. It is the policy of the District to secure certificates of delinquency as soon as the law permits on all lands upon which taxes are in arrears.

Table 13 shows the assessments levied from 1928 to 1932, inclusive, and the receipts and disbursements over the same period for the fiscal year ending November 30.

TABLE 13. - Assessments, Receipts, and Disbursements of Grants Pass Irrigation District, by years, 1928 to 1932, inclusive

Year Payable	Irrigation Assessment	Total Receipts	Disbursements	
			Bond Interest	Operation, Maintenance, Construction, etc.
	Dollars	Dollars	Dollars	Dollars
1928	107,806	84,751	2,280	56,767
1929	103,023	64,725	38,910	58,173
1930	109,070	76,936	17,760	59,330
1931	111,480	88,236 1/	29,202	59,517 1/
1932	105,726	66,229 2/	18,980	46,522 2/

1/ $6,299 collected as general tax on certificates of delinquency and remitted to county.
2/ $3,742 collected as general tax on certificates of delinquency and remitted to county.

The District assessments represented by the figures in Table 11 were at the rate of $8.50 per acre except the last one, which was at the $6.50 rate. In addition to these assessments, the lands have to meet general tax levies made by other taxing units (State, county, city, school, etc.), which in 1931 averaged $1.69 per acre, and in 1932, $1.71 per acre. The amounts of taxes and district assessments delinquent to date for each of the past five years, are as follows:

1927	$32,454.66
1928	35,609.35
1929	43,414.47
1930	58,998.01
1931	74,400.32

In explanation of these figures, it may be said that when the District takes out a delinquent certificate there is included in the face of the certificate the amount of unpaid county and State taxes as well as the unpaid District assessments. No money is paid to the county when the certificates are taken out, but it is understood that the first money received by the District from the redemption of the certificate, or from the sale of the land if it has been foreclosed upon, will be used to pay the State and County taxes.

The State loan is still properly carried as an obligation of the District, although no accrued interest has been added to the account for three years past, because of the expectancy that the State will enter upon a refunding plan to the extent of waiving its entire equity, if the plan be considered feasible and liberal sacrifices are made by other creditors.

Of the current liabilities shown in the balance sheet, the outstanding warrants are practically identical with those outstanding in 1928. With the exception of five warrants for $1500, these are registered warrants of 1923, 1924, 1925, and 1926 dates, and having connection with the construction programs of that period. The accounts payable represent bills owing the power company for several years. The amount is some $7500 less than that owed in 1928, the District having been able since then to meet bills for electricity currently accruing, as well as effecting this reduction in the previous accumulation.

A comparative analysis of the District's expenses for the last four years is made in Table 14. It will be noted that the power and light item has been the heaviest single item of expense in all years except 1932. In the latter year, the operation and maintenance cost, per assessment paying acre, was distributed as follows: Administration, $0.54; operation, $1.90; maintenance and repairs, $0.81; replacements, $0.20; new construction, $0.33; total, $3.78. (The total is substantially higher if irrigated land alone is considered.)

The financial operations of the District for the year ended November 30, 1932, are summarized in Table 15.

Operation and Maintenance

The following paragraphs are quoted with the present author's concurrence, from the September 1932 report of Hydraulic Engineer E. B. Debler, heretofore described:

> "The apparently high cost of operation and maintenance is due to many unusual features. Water is being delivered to more than 1000 individual tracts necessitating the employment of 10 men to ride ditch and distribute water. The same number of deliveries would with most projects of staple crops correspond to an irrigated area of 40,000 to 50,000 acres. Purchased power accounts for a charge of $1.50 per irrigated area. Flood damage by the river and the upkeep of so much machinery and so many flumes and pipe lines is expensive. Hillside slides have caused considerable expense for removal.
>
> "Much consideration has been given to ways and means of reducing operation and maintenance costs and to provide more security against slides interrupting irrigation services. Concrete lining has been urged for this purpose in the belief that such slides are occasioned by canal losses. It is my view that the slides are largely due to disturbance of the steep slopes of the hills in a region where rainfall averages 25 inches from October to March, inclusive. This appears to be borne out by the fact that only one important slide has occurred in the (1932) irrigation season and then just a day or two after a severe earthquake. If this view be correct, then the useful-

TABLE 14. - Comparative Analysis of Expenses of Grants Pass Irrigation District for the Four Years Ended November 30, 1932

	Year Ended Nov.30,1932	Year Ended Nov.30,1931	Year Ended Nov.30,1930	Year Ended Nov.30,1929
OPERATING EXPENSES:				
Directors' Fees and Mileage	$ 234.80	$ 295.20	$ 220.80	$ 197.90
Manager's Salary	2,800.00	3,350.00	3,600.00	3,600.00
Office Salaries	937.50	1,012.50	900.00	925.00
Legal and Audit Expense	1,644.55	2,034.35	1,126.85	1,107.50
Tele. & Teleg. & Postage	114.75	134.80	135.33	123.48
Refund of Assessments	219.35	268.92	111.65	24.62
Misc. Administrative Expenses	839.55	247.80	240.63	619.66
Election Expenses	13.25	14.00	28.75	17.00
Publication of Notices	10.50	65.80	92.35	74.50
Pump Tender's Salary	1,500.00	1,775.00	1,800.00	1,780.00
Maintenance Labor	7,620.21	7,367.60	9,133.99	7,379.11
Ditch Riders and Others	7,926.11	9,506.50	8,271.33	6,987.39
Power and Light	6,342.70	9,726.51	12,851.00	13,098.81
Repairs to Tools & Equipment	64.50	104.98	114.73	69.04
Industrial Accident Insurance	206.31	339.46	639.42	260.03
Automobile Expense	1,882.12	1,233.77	1,497.02	1,501.43
Misc. Operation & Maintenance	197.99	566.35	853.58	348.91
Maintenance Supplies Used	372.38	448.03	936.39	1,324.33
Repairs and Renewals	4,560.55	7,603.38	5,629.48	4,255.24
Other Expenses	78.04	--	325.00	1,203.47
TOTAL OPERATION & MAINTENANCE	$37,565.16	$46,099.95	$48,508.30	$44,903.04
FINANCIAL EXPENSES:				
Interest Account on Warrants[1]	$ 1,935.75	$ 1,941.41	$ 1,947.75	$ 1,947.84
Interest on Bonds	18,980.00	29,201.98	29,926.00	87,600.00
Interest Accrued on State Loan	None	None	None	19,098.79
TOTAL FINANCIAL EXPENSE	$20,915.75	$31,143.39	$31,873.75	$108,646.63
PHYSICAL PROPERTY:				
Tools and Equip. Purchased	$ 237.78	$ 1,954.08	$ 146.25	--
New Construction	3,922.20	5,632.89	7,545.93	$10,950.45
Office Equipment Purchased	--	189.00	185.86	284.37
TOTAL PHYSICAL PROPERTY	$ 4,159.98	$ 7,775.97	$ 7,878.04	$11,234.82

[1] All expenses listed above for the year ended November 30, 1932, are disbursements except interest on warrants, which is an accrual.

TABLE 15. - Statement of Receipts and Disbursements of Grants Pass Irrigation District for the Year Ended November 30, 1932

BEGINNING BALANCES AND RECEIPTS		
BALANCE ON HAND DECEMBER 1, 1931:		
District Revolving Fund		$ 15.48
General Fund in hands of County Treasurer		1,380.09
Interest Fund in hands of County Treasurer		680.30
Delinquent Certificate Account		7,558.68
TOTAL BEGINNING BALANCES		$ 9,634.55
ADD RECEIPTS:		
Taxes collected with Penalties and Interest	$46,103.68	
Water Rentals	484.45	
Sale of Supplies	84.00	
Tax Collections from Jackson County	3,693.27	
Gasoline Refunds	38.15	
Construction Levy Collected from Krause	41.80	
Receipts on Land Sales and Contracts	3,593.46	
Collections on Delinquent Certificates	8,445.07	
Miscellaneous	509.36	
Collection of County Portion of Tax on Delinquent Certificates to be remitted to Josephine County	3,235.20	
TOTAL RECEIPTS		66,228.74
TOTAL TO BE ACCOUNTED FOR		$75,863.29
DEDUCT DISBURSEMENTS:		
Disbursed for Operating and Other Expenses	$60,705.14	
County Portion of Taxes remitted to Josephine County (including some collections of prior year)	3,742.16	
Real Estate Commission Paid	660.89	
Miscellaneous Delinquent Certificate Expense	364.45	
Tax Refund	29.22	
TOTAL DISBURSEMENTS		65,501.86
BALANCE ON HAND NOVEMBER 30, 1932:		
General Fund	6,619.93	
Bond and Interest Fund	751.33	
Revolving Fund	231.18	
Delinquent Certificate Account	2,758.99	$ 10,361.43

ness of concrete lining to provide greater assurance of water deliveries is limited to a few short lengths of canal.

"Lining should, and will necessarily need, be undertaken to conserve water as the irrigated area grows. Its introduction will probably aggravate the moss problem and its upkeep, particularly on the shaded slopes, will entail considerable maintenance because of frost damage with alternately freezing and thawing temperatures in a very moist winter climate.

"The annual outlay for power will increase as the irrigated area is increased, since the practice of paying District charges without taking water is now more common on electrically pumped areas than elsewhere and less of the irrigable area is there irrigated than elsewhere. The need for conservation of water will necessitate outlays so long as the area increases to its limit. A levy of $6.00 to $6.50 per irrigated area for operation and maintenance, per acre, is believed necessary to provide satisfactory water service, properly maintain the system, and make needed or desirable improvements as the irrigated area increases."

Summarizing his ideas on operation and maintenance, Mr. Debler said:

"In the matter of construction work, my conclusions are that damage by floods and slides such as has occurred, will continue to occur periodically and should be cared for with operating funds, the damage to date not being of an extent properly warranting its designation as reconstruction, and that extensive concrete lining of canals is not justified at this time as it will not obviate slides which are primarily due to disturbance of steep hillsides in a region subject to heavy rainfall through the winter season. The moderate amount of lining that is so justified along with strengthening of the few weak links in the distribution system can be effected with funds from a small special levy that should be made from time to time in addition to ordinary operating costs, to care for desirable improvements. Extensive lining, or more likely substitution of pipe lines for open ditches, may eventually be desirable to be in keeping with a project of small holdings and attractive homes, and necessary to provide adequate water for the entire area by reduction of losses. This work should not be undertaken until made necessary by increased development.

"The District can not hope to escape heavy costs for operation and maintenance if the system is properly operated and maintained to give satisfactory service and if a small amount is each year invested in desirable improvements. It has now been in operation 15 years and although only half irrigated it is unlikely that annual costs will in future fall much if any below present per acre costs. Additional irrigation will increase power costs and necessitate increasing the operating personnel. Lining or piping to save water will introduce more cost for maintenance. Replacements which have in past years in part been made with funds obtained by means of bonds or warrants still outstanding should be made with funds provided by assessments for operation and maintenance."

The Burden of Pump Costs

Notwithstanding the curtailment of the amount owing the power company, and the substantial reduction of the annual power bill disclosed by Table 14, the expense of delivering water to the four pump units (Jerome Prairie, Sand Creek, Allen Creek, and Demaray, see Table 3) still constitutes a heavy burden not only on their lands but also on the remainder of the District, since the District's uniform assessment is not enough to cover service to the pump units by a substantial amount. This is shown in detail for the 1932 season by Table 16.

TABLE 16. - Operation of Power-pump Units of Grants Pass Irrigation District, Season of 1932

Pump Lift	Jerome Prairie	Sand Creek	Allen Creek	Demaray
Size of pump (Inches)	16	8 x 10	12	12
Pump lift (Feet)	90	154	141	110
Motor capacity (Horsepower)	250	150	200	125
Pump capacity (g.p.m.)	9000	3150	4500	3600
Area irrigated (Acres)	658.15	317.5	256.55	363.6
Total area (Acres)	1637.30	1448.6	738.0	454.9
Minimum power charge (Dollars)	3105.00	1905.00	2505.00	1605.00 (Used 1771.24)
Power cost, per acre irrigated (Dollars)	4.72	6.05	9.77	4.87
Cost of ditch cleaning, per acre irrigated (Dollars)	0.83	0.99	1.33	0.47
Cost of water delivery, per acre irrigated (Dollars)	0.43	0.82	0.98	0.88
Repairs, new construction, replacements, per acre irrigated (Dollars)	0.62	1.15	1.31	1.11
Total Cost, per acre irrigated (Dollars)	6.60	9.01	13.39	7.33
Total Cost, per acre assessed (Dollars)	2.66	1/	4.62	5.86

1/ Present pump will not furnish water for all acreage.

Mr. Debler's remarks are quoted because they express clearly the present author's ideas on the subject. There is more to be said, however; for while it appears that small if any saving can be hoped for in the continuance of the operation of the system as it is now constituted, the cost is high in relationship to revenues both past and prospective -- so high, in fact, as to promise little revenue by which to reduce the District's obligations even if the latter were substantially reduced. Moreover, with the possible exception of the Demaray unit, the settlement of the areas under the four pump units is slow -- too slow, in fact, to promise the reclamation of their entire irrigable area for many years.

It was the original plan (as expressed by the Board of Directors of the District in a resolution adopted June 23, 1922) that the District as a whole would bear the minimum charge for power for pumping for the period 1922 to 1941, inclusive, but that each of the four units would bear its own power charge in excess of the minimum during that period; and that thereafter (beginning with 1942) each of the pumping units would bear its entire charge for electric power for pumping.

The Board took action on June 6, 1933 which looked to the shutting off of water from lands three years or more delinquent in the payment of assessments. It was said that if enforced, this order would prevent deliveries to approximately 85 per cent of the lands under Jerome Prairie, Sand Creek, and Allen Creek pumps, lands under the Demaray pump being in somewhat better status. The broad circumstances which chiefly concern the Board and the water users in the units not using the expensively provided pumped water, are that most of the total area in the pump units has been getting water wholly at the expense of the other units, and that it is much more expensive water than the other units use.

Serious consideration has been given by the Board to suggested methods of correcting the burdensome unfairness of these circumstances. One proposed plan (which would have to have the approval of the bondholders and other creditors before it could become operative) would involve the withdrawal from the District of the lands under the four pumps (Demaray possibly excepted), their incorporation into separate irrigation districts or farmers' cooperative companies, and the transfer to them of the pumping equipment by which they are now served at such valuation (perhaps very low, as related to original costs, possibly merely nominal) as would permit the lands surely to defray the cost of their operation. The contention in favor of this plan is simply that the District would be better off without the pump-unit lands than with them; that it could well afford to separate its other units from them. As to whether or not such a separation would wipe out the present obligation of the pump-unit lands in the bond set-up, or would carry with it an obligation in a revision of the present basis; whether or not it would involve the waiving of tax delinquencies now standing against the pump units; and what the arrangement would involve with reference to the old power bill, are questions about which the plan's proponents had differing ideas. As to whether or not the water users under the pumps would agree to the plan was also a question; but while a complication lay in the fact that a small portion of the lands are not delinquent, the delinquencies of the other lands unquestionably give the District a basis for persuasive negotiations at least, and doubtless much stronger action if it seemed advisable.

With the purpose of examing the effect such a separation would have upon the cost of operating the remainder of the system and the burden it would impose upon the lands which would remain in the District, the author of this report asked Assistant State Engineer McLellan to prepare an estimate contemplating such an arrangement. Mr. McLellan accordingly prepared the following set-up, intending it to be merely suggestive, and admitting it to be subject to some amendment and possible correction.

"Following is a set-up covering the cost of operation and maintenance for an area of 8,312 acres of the Grants Pass Irrigation District which are served by the canal and the Savage Rapids pumps. This does not contain any power charges nor does it contain any item for reconstruction although it does make provision for the annual repairs and renewals to the irrigation system.

"I arrived at the cost of the several items for 12,591 acres in Column 2 (of Table 17) by taking the approximate average expenditure for the past several years. In Column 3 is an estimate of the cost of the same items for the District of 8,312 acres. You will note that practically all the expenditures are estimated about the same for the reduced area as for the present, with the exception of maintenance labor, patrolmen and operating labor, industrial insurance, auto upkeep, miscellaneous operation and maintenance, supplies, repairs and renewals. On the latter expenditures I took an arbitrary reduction of 34 per cent to conform with the per cent that the eliminated area bears to the entire area. In Column 4, I have shown the amount which would be charged to the reduced area, and in Column 5 is shown the amounts which would be charged to the pumping units for their estimated share of the maintenance on the canals from which they would pump their water, and also a share for the operation of the dam."

TABLE 17. - Estimated Cost of Operation and Maintenance of a System to Serve a Reduced Area[1] of Grants Pass Irrigation District

1 Item	2 Cost for 12,591 acres	3 Est. Cost for 8,312 acres	4 Amount Charged to 8,312 acres	5 Amount Charged to 4,279 acres
	Dollars	Dollars	Dollars	Dollars
Directors' Fees	250	250	250	
Manager's Salary	3,600	3,600	3,240	360
Office Salaries	1,000	1,000	1,000	
Legal and Audit	1,100	1,100	1,100	
Tel. & Tel. & Postage	125	125	125	
Refund of Assessments	200	200	200	
Misc. Adm. Expenses	250	250	250	
Election Expense	14	14	14	
Publication of Notices	50	50	50	
Superintendent	1,800	1,800	1,620	180
Maintenance Labor	7,500	4,950	4,050	900
Patrolmen & Oper. Labor	8,500	5,940	5,643	297
Repairs to Tools & Equip.	100	100	100	
Industrial Insurance	300	198	198	
Auto Expense	1,500	1,200	1,200	
Misc. Oper. & Maintenance	500	330	330	
Supplies	500	330	330	
Repairs & Renewals	7,500	4,950	4,950	
Total	34,789	26,387	24,650	1,737
Per Acre	2.76		2.97	0.41

1/ Present area of District 12,591 acres; area under pumps, 4,279 acres, or 34 per cent; area under Dam and Gravity Canals, 8,312 acres, or 66 per cent.

The crop uses to which the lands in the four pump units are put are shown (as are also the corresponding facts for the other units) in the three tables comprising Appendix A.

Other Community Obligations

In addition to the bonds of the Irrigation District itself, other community indebtedness supported by taxes is comprised of school district bonds as follows: (1) School district No. 30 (Dimmick), $7,000 or 5 per cent bonds are outstanding; issued 1928; due from 1939 to 1945. (2) School district No. 32 (Jerome Prairie), $500 left of $1,000 of 6 per cent bonds will be due October 1, 1933 and October 1, 1934; also a $5,000 issue made in 1925, carrying 5¼ per cent, will mature from 1936 to 1945. (3) School district No. 7 (Grants Pass), bonds as shown in Table 18, totalling $91,000. (School district No. 7 has also a warrant indebtedness of $68,343.40.)

TABLE 18. - Bonds of School District No. 7
Josephine County, Oregon

Total amount of issue	$17,000	$15,000	$61,000
Series of	34 Bonds	30 Bonds	61 Bonds
Date of issue	October 1, 1922	October 1, 1922	April 1, 1924
Purpose of issue	Construction	Warrant refunding	Construction
Kind of bonds	$1500 payable 11th to 16th years, inc.- $2000 payable 17th to 20th years.	10% each year after 10th year	10% each year after 10th year or optional.
Denomination	$500 each	$500 each	$1,000 each
Rate of interest	5%	5½%	5%
Provision for payment	Budget 1931-32 provided $7,500 for sinking fund; 1932-33, $4,000; 1933-34, $3,000 -- $2,000 spent for bonds October 1, 1932.		
Present holders	Chase National Bank, New York City		

($3,500 sent October 1, 1932, by mistake, to redeem bonds of $17,000 and $15,000issues. Four bonds called on the $17,000 issue returned. Total bonded indebtedness, $91,000.)

The average annual obligation against the land, as represented by the District's present assessment of $6.50 per acre and the general tax levy, is therefore $8.20 per acre.

CONCLUSIONS AND SUGGESTIONS

No cost of production figures applying to the crops in which many of the farmers have specialized in recent years are available to show convincingly what revenue they might be expected to produce in the future. The doubts expressed by the authors of the 1928 report as to the dependence which might safely be placed upon bulbs as a staple and steadily profitable product have been justified by the ensuing trend of events. When the District was again visited in 1933, strawberry producers were getting satisfactory prices for that crop; but the crop was short because of severe weather which had affected production from other berry sections as well as Rogue River Valley. There appears to be neither opportunity for nor much reason to urge an expansion of alfalfa growing, as the area adapted to that crop is limited by soil and underground water conditions, and ladino clover has proven admirably suited to the conditions affecting the dairy industry. Berries, bulbs, truck, and certain seed crops will continue properly to have a place in the District's agriculture, but not the important place previously hoped for.

The importance of livestock stressed in the 1928 report is still apparent. It was then considered that practically every small farm in the District "will be some kind of a livestock unit. This will be due to several reasons, chief among them being that the land is naturally somewhat low in fertility, and that the production of specialty crops such as bulbs, berries, and other intensive crops requires a systematic fertilizing program. Then, too, the livestock units will reduce the hazard somewhat of the specialty crop business.

"These livestock units will either be small dairy units of say ten cows or flocks of from four hundred to one thousand hens, or perhaps a combination of both. While few of the farms are of that size the ideal irrigated twenty-acre tract will perhaps eventually be developed with acreage somewhat along the following lines." [1]

Proposed layout for a twenty acre dairy farm, basis 12 cows

Pasture	6 acres
Clover hay	8 "
Roots and kale	2 "
Buildings	1 "
Early potatoes (followed by cabbage or broccoli)	1 "
Berries	1 "
Cannery vegetable crops	2 "
Total	20 acres

[1] Slightly amended from the 1928 set-up.

Proposed layout of acreage for twenty acre poultry and berry farm

Basis 1000 hens

Buildings and yards	2 acres
Kale and root crops	2 "
Alfalfa or clover (for hay and pullet range)	4 "
Strawberries	2 "
Raspberries	1 "
Loganberries or blackberries	1 "
Corn for grain	5 "
Vegetables for cannery	2 "
Bulbs	1 "
Total	20 acres

Notwithstanding these suggested set-ups, it is obvious that the pronounced trend toward smaller and smaller farms is directly counter to proposals contemplating the development of 20-acre farms. Not to be disguised is the fact, already mentioned, that the development of the District as it has proceeded in recent years, has not been along strictly agricultural lines in the usual meaning of the term. Mr. Debler's observations of 1932 are again in point:

> "While it seems reasonably certain that the entire project will some day be comprised of small holdings with attractive homes and with the owners then capable of meeting charges materially greater than operation and maintenance requirements, the present situation with half irrigation, new development and all its troubles, together with the unstable conditions in agriculture preclude a reliable estimate of the paying ability of the project in the next few years. Assessments that have been met by the irrigated lands are probably the best guide to paying ability."

In other words, the indebtedness-paying ability of the District should be recognized as not being wholly dependent upon the returns from agriculture. In better times than the present, a substantial revenue from other sources might be depended upon to pay taxes partly equivalent to fair rentals; and in those circumstances a higher per-acre obligation than that supportable by agriculture would be neither unfair nor impracticable.

The author of this report considers that the District has done remarkably well in the recent distressing period in paying as substantially as it has done toward meeting its bond-interest obligations. He agrees that "assessments that have been met are probably the best guide to paying ability"; moreover, he believes that a paying ability demonstrated in a period of depression provides a much sounder basis for a supportable financial plan than one adopted in a time of prosperity perhaps exaggerated, or one based upon assumed average conditions or hoped-for improvement.

At the same time, the infeasibility of the pumping development is believed to have been amply demonstrated, and a way to separate at least three of the pumping units from the remainder of the District should be sought. Dependent upon the outcome of such an effort as well as upon a favorable upturn in the farming and other industries of the community, will be the District's future ability to pay its debts.

A revision of the bond indebtedness is inevitable, if for no other reason than that many of the old maturities, passed so far as dates are concerned, have still to be met by payments. There should be one issue instead of five, and its maturities should be spread over a long period of years. Its total should be substantially lower than the total of the present bonds.

Under the circumstances which have existed, the performance of the District in gradually increasing its productive area in the last five years has been most creditable, but not too much should be expected in the way of reclamation of present unproductive areas, although the possibilities are not entirely exhausted.

APPENDIX A. -- Crop Acreage and Value Report Under Units of Grants Pass Irrigation District, October 1, 1930.

Unit	Grain	Al-falfa	Clover	Ber-ries	Corn	Garden	Or-chard	Pota-toes	Vine-yard	Bulbs	Pas-ture	Total Area Irrigated	Total Irrigable Area
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Main Canal	37.4	101.3	667.3	53.1	17.9	121.5	49.1	3.9	0.5	83.1	52.8	1187.9	2817.2
South High Line Canal	4.5	19.9	428.5	34.3	17.8	94.7	48.8	2.6	10.0	47.3	110.8	819.2	1840.3
Northwest Unit		240.0	382.2	4.0	33.0	77.9	72.5	2.5	1.0	20.5		833.6	1074.0
Tokay Canal	46.0	155.4	480.7	12.8	41.5	185.1	146.3	2.0	34.3	30.8	298.4	1433.3	2020.6
Allen Creek Pump	7.0		94.7	8.4	4.3	16.9	0.5	2.8		23.7	52.4	210.7	738.0
Sand Creek Pump		9.5	347.0	24.0	23.0	29.8	68.0	2.0	1.0	22.2		526.5	1448.6
Jerome Prairie Pump		2.0	233.5	44.3	8.0	24.6	8.0			28.3	8.0	356.7	1637.3
Demaray Pump		14.9	227.2	8.2	3.0	17.6	31.6	2.0	6.5	7.2	6.4	324.6	454.9
Evans Creek Canal	49.3	80.3	64.0	6.3	16.8	50.7	54.0	6.0	1.0	0.5	22.5	351.4	448.0
Savage Lateral		30.0	4.6		1.0	8.0	11.0			1.0	22.1	77.7	112.4
Total Acreage	144.2	653.3	2929.7	195.4	166.3	626.8	489.8	23.8	54.3	264.6	573.4	6121.6	12591.3

October 1, 1931

Unit	Grain	Al-falfa	Ber-ries	Clover	Corn	Gar-den	Bulbs	Or-chard	Pota-toes	Vine-yard	Pas-ture	Toma-toes	Hops	Total Area Irrigated	Total Irrigable Area
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Main Canal	17.5	151.0	53.5	555.2	21.0	126.5	65.3	61.0	3.0	9.0	370.9		14.0	1447.9	2817.2
South High Line Canal		23.7	56.4	381.5	12.0	67.7	37.7	32.3	8.5	0.8	302.2			922.8	1840.3
Northwest Unit	7.5	264.5	9.8	137.8	31.5	53.2	23.8	75.7	7.5		146.9	6.5		764.7	1074.0
Tokay Canal	18.0	136.3	25.5	450.5	27.3	195.0	26.2	140.0	5.8	34.3	324.5			1383.4	2020.6
Allen Creek Pump		2.0	14.0	149.7	10.0	17.5	21.0	0.8	0.8		17.3			233.1	738.0
Sand Creek Pump			3.3	252.3	8.5	8.0	1.0	28.5						301.6	1448.6
Jerome Prairie Pump			98.0	260.5	6.0	59.3	30.5	33.0	3.0	1.8	78.0	5.0		575.1	1637.3
Demaray Pump		4.5	4.3	27.7	11.5	22.7		18.9	0.3	4.3	208.4	3.0		305.6	454.9
Evans Creek Canal	68.6	93.3	4.3	68.0	25.0	47.3	1.0	40.8	2.5		57.6	2.0		410.4	448.0
Savage Lateral		15.0	1.0	10.0	3.0	15.5	0.5	15.0			9.6			69.6	112.4
Total Acreage	111.6	690.3	270.1	2293.2	155.8	612.7	207.0	446.0	31.4	50.2	1515.4	16.5	14.0	6414.2	12591.3

APPENDIX A. (Contd.) -- Crop Acreage and Value Report Under Units of Grants Pass Irrigation District, October 1, 1932

Unit	Grain	Al-falfa	Ber-ries	Clover	Corn	Gar-den	Bulbs	Or-chard	Pota-toes	Vine-yard	Pas-ture	Toma-toes and Beans	Hops	Total Area Irrigated	Total Irrigable Area
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Main Canal	20.0	133.75	50.25	756.5	28.	177.02	47.45	58.	.50		270.8	17.0		1559.27	2817.20
South High Line Canal	7.0	20.0	43.3	534.7	23.95	135.5	30.0	36.7	9.5		190.6	2.0		1033.25	1840.30
Northwest Unit	43.0	177.25	9.75	172.50	48.75	76.10	19.5	76.0	4.50		164.32	20.0		811.67	1074.00
Tokay Canal	34.5	144.5	32.35	494.25	38.2	191.95	22.5	106.2		32.35	234.75			1331.55	2020.60
Allen Creek Pump	5.0		10.75	161.45	3.25	27.95	13.25		5.0		29.9			256.55	738.00
Sand Creek Pump			4.75	207.25	8.5	13.5		20.0			63.5			317.50	1448.60
Jerome Prairie Pump		5.5	121.25	257.15	19.5	70.75	20.75	14.25		2.0	147.0			658.15	1637.30
Demaray Pump	6.0	5.0	6.5	138.8	6.8	31.0	8.0	18.2		6.5	136.8			363.60	454.90
Evans Creek Canal	68.2	96.1	1.2	104.6	13.0	52.8	0.8	32.0	0.5		45.6			414.80	448.00
Savage Lateral		13.5		16.0	2.0	8.5	0.5	17.0			2.0		14.0	73.50	112.40
Total Acreage	183.7	595.6	280.1	2843.2	191.95	785.07	162.75	378.35	20.0	40.85	1285.27	39.0	14.0	6819.84	12591.30

Number of water users - 1,068.

APPENDIX A (Concl.) -- Crop yields and acres harvested before Dunkel Dam in relation to Central Lake Irrigation District, 1960 through 1964

Crop	Yield 1960	Acres 1960	Yield 1961	Acres 1961	Yield 1962	Acres 1962	Yield 1963	Acres 1963	Yield 1964	Acres 1964
Alfalfa (hay)	4.25	1,000	5.00	1,100	5.25	1,200	5.50	1,300	5.75	1,400
Barley (grain)	1.50	300	1.75	350	2.00	400	2.25	450	2.50	500
Barley (hay)	1.00	100	1.25	125	1.50	150	1.75	175	2.00	200
Beans, dry edible	0.75	50	1.00	75	1.25	100	1.50	125	1.75	150
Corn (grain)	1.00	200	1.25	250	1.50	300	1.75	350	2.00	400
Corn (silage)	5.00	100	6.00	120	7.00	140	8.00	160	9.00	180
Cotton, Pima	0.50	150	0.75	200	1.00	250	1.25	300	1.50	350
Cotton, Upland	0.40	300	0.60	400	0.80	500	1.00	600	1.20	700
Grain sorghum	1.00	400	1.25	500	1.50	600	1.75	700	2.00	800
Grass hay	2.00	150	2.25	175	2.50	200	2.75	225	3.00	250
Lettuce, head	0.50	50	0.75	75	1.00	100	1.25	125	1.50	150
Melons	0.25	100	0.50	150	0.75	200	1.00	250	1.25	300
Onions, dry	0.75	50	1.00	75	1.25	100	1.50	125	1.75	150
Pasture, irrigated	2.00	200	2.25	225	2.50	250	2.75	275	3.00	300
Potatoes, Irish	0.50	100	0.75	150	1.00	200	1.25	250	1.50	300
Sugar beets	0.25	150	0.50	200	0.75	250	1.00	300	1.25	350
Tomatoes, processing	0.50	100	0.75	150	1.00	200	1.25	250	1.50	300
Wheat, hard red winter	1.00	500	1.25	600	1.50	700	1.75	800	2.00	900
Total		3,000		3,500		4,000		4,500		5,000

Source: Table 1 - Acres in crops, 1960.